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SUSQUEHANNA RIVER BASIN COMMISSION
5012 LENKER STREET
MECHANICSBURG, PENNSYLVANIA 17055

STAFF REVIEW - III

OF

PROPOSED

LOCK HAVEN

FLOOD PROTECTION PROJECT

NOVEMBER 14, 1974

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INTRODUCTION

A. Description of the Project

The most recently completed U.S. Army Corps of Engineers Flood Control Study in the West Branch Susquehanna River Basin was directed to the development of a single purpose plan to provide protection to the City of Lock Haven, Clinton County, Pennsylvania, against flooding from the West Branch and Bald Eagle Creek.

The flood control plan formulated by the Corps calls for construction of flood walls and levees with associated interior drainage and closure structures. This plan is considered by the Corps at this time as the soundest, most practical and most economical plan of protection for Lock Haven.

Generally, the protection plan is divided into two sections due to the geographic layout of the city. The principle area to be protected is along the Susquehanna River and consists primarily of the central business district and residential housing. Another area to be protected is along Bald Eagle Creek where land use is primarily agricultural and industrial. The proposed plan requires 10,000 feet of conventional concrete flood wall reaching a maximum height of 18 feet. Earthen levees will be required in various other sections of the area to be protected. A section of this earthen levee will be formed

by the proposed U.S. 220 Lock Haven By-pass.

The proposal lists 16 closure structures to be located at intersections of the wall/levee system with railroads, highways and two streams. The principal interior drainage facilities will consist of 5 pumping stations, 5 ponding areas, gravity outlets with automatic drainage and slide gates, and interceptor drains.

1. Flood History - Lock Haven

Since 1847 when recording the flood information was initiated the City of Lock Haven has been flooded 18 times with major floods occurring in 1889, 1894, 1936, 1946, 1950, 1964 and 1972. The flood of record occurred in 1936 and the most recent major flood which occurred as a result of Tropical Storm Agnes in June 1972 came within two feet of this record level. The 1972 flood inundated over 55% of the City causing damages estimated to be in excess of 50 million dollars. In addition to inundation during major runoff events it should be noted a 10-year frequency flood is sufficient to overtop the banks and cause flooding within the City.

B. Purpose and Basis of This Review

The Commission, created by a Federal-Interstate Compact, P.L. 91-575 (84 Stat. 1509 et seq.), is the regional govern-

ment agency responsible for effecting comprehensive multipurpose planning, programming and management of the water and related resources for the Susquehanna River Basin. It fulfills this mandated duty by exercising authority in the Compact providing for implementation of its Comprehensive Plan for management and development of the water resources of the Susquehanna River Basin, coordination of planning efforts and programs of government agencies and the private sector, and review of projects affecting the water and related resources of the basin.

The Commission reviews projects to ascertain the projects' compatibility with the objectives, goals, guidelines and criteria set forth in the Comprehensive Plan. The purpose of this review is to evaluate the Lock Haven Flood Protection Project proposed by the Corps of Engineers in terms of the Commission's objective and goals for flood damage reduction which are:

Program Objective

To prevent loss of life and significantly reduce future damages from floods within the basin through an integrated system of structural flood control and nonstructural flood plain management measures.

Goals

a. A basinwide flood plain use plan to guide

flood plain development and redevelopment so as to prevent loss of life and reduce future flood damage.

b. Effective control over flood plain use and development in all areas susceptible to flooding.

c. Increased flexibility in Federal policies to enable allocation of Federal funds for flood plain management, land acquisition, and other nonstructural measures.

d. A basinwide program of flood damage reduction structures that includes consideration of multipurpose water storage and is integrated with nonstructural flood plain management measures.

e. Establishment of an improved and expanded flood forecasting and warning system to provide the maximum amount of time during which evacuation and other damage reduction measures may be taken.

This review is based upon the following information:

1. Survey Report - Main Report, dated September 1974, Revised Draft - Environmental Impact Statement dated October 1974 - Survey Report Volume II

Parts 1 and 2 dated September 1974 prepared by the Department of the Army, Baltimore District, Corps of Engineers.

2. Testimony presented at a joint public meeting held with the Corps of Engineers on August 20, 1974 in Lock Haven, Pennsylvania.

3. Meeting with Corps and Pennsylvania DER personnel.

4. Final Environmental Impact Statement - Lock Haven Urban Renewal Project, Pa. R-654(c) Lock Haven, Pennsylvania.

DISCUSSION

A. Areas of Concern

Evaluation of the project in terms of the SRBC Comprehensive Plan and consideration of public expressions at a joint Corps/SRBC public meeting August 20, 1974, resulted in the identification of several issues. Generally, the broad issues are local protection vs. regional flood control and the apparent minimum effort by the Corps to adequately address the consideration of possible alternatives. The following discussion explores the local and regional implications resulting from the project's purely local flood protection purpose in the West Branch subbasin of the Susquehanna River.

1. Regional Flood Control

The West Branch Susquehanna River has a long history of flooding with a growing record of loss of life, property damage and general economic upheaval to the communities along its banks.

The obvious flood prone nature of the West Branch Susquehanna River valley has triggered Federal funding of several broad, regional flood control studies by the Corps of Engineers. These studies generally have been directed toward identifying reservoir sites with large storage capacity

and the formulation of a regional system to reduce flood stages along the West Branch and other major tributaries of the Susquehanna River. The need was also identified for local protection projects at certain flood prone areas, including a project at Lock Haven.

The first extensive study of flood control in the West Branch basin is contained in a report entitled Preliminary Examination and Survey of the Susquehanna River Basin and Tributaries, House Document 308, 69th Congress, 1st Session, dated May 6, 1938. Many sites for impoundments were investigated with major locations on the West Branch being identified at Keating, Westport and Cooks Run. On the basis of this study flood control dams were found feasible at Keating, Kettle Creek, Mill Hall and Blanchard. The Westport site was considered to be the most advantageous main stem location and the report recommended construction of a multipurpose dam at the site.

A second study embodied in House Document 702, 77th Congress, 2nd Session, dated 1942, was a review of House Document 308. This report concluded that a dam at Westport was feasible in terms of its potential to control runoff from a large drainage

area. Since the dam could not be economically justified on the basis of flood control alone, it was recommended that construction be deferred until electric power generation could be included as a purpose at the site. The additional reservoir sites considered in this study were Curwensville, Keating, Huntley, Salona and Ramsey. It was determined that the flood stages at Lock Haven due to a recurrence of the 1936 flood would be reduced by 10 feet by the Westport Dam, and 6 feet by the Keating Dam.

The regional approach to providing flood control in the West Branch valley was continued in the late 1940's when the Corps of Engineers, Baltimore District, initiated a review of House Document 702. The results of the study are contained in House Document 29, 84th Congress, 1st Session, dated October 7, 1954. Thirty sites were investigated for flood control purposes and four dams were recommended for authoriztation. These four have since been built at the Kettle Creek (Alvin Bush Dam), Stevenson, Curwensville and Blanchard (Sayers) sites. The Keating Dam was deferred for future study. An important and recurring theme of the three Corps of Engineers studies was the need for upstream storage measures to provide broad regional control of flooding along the West Branch Susquehanna River.

A comprehensive study of the water resources of the Susquehanna River Basin was initiated in 1963 on the basis of resolutions adopted in 1961 by the U.S. Senate Committee on Public Works and in 1962 by the Committee on Public Works of the House of Representatives.

Consideration of flood control throughout the Susquehanna River Basin was one of the several purposes of this study. The study was chaired by the Baltimore District of the Corps of Engineers, and was completed in 1970. In its report 20 sites for flood control dams upstream of Lock Haven were identified, including the Keating project. The Westport and Cooks Run sites identified in earlier studies were eliminated from further consideration. The Keating site which included power generation facilities reportedly was not recommended because of anticipated high construction and relocation costs. The final report recommended construction of many reservoirs throughout the Susquehanna River Basin, most of which were small with limited potential for flood storage. Wall/levee type of flood protection was recommended at major damage centers, including Lock Haven. Recommendations were also made for initiation of nonstructural measures at numerous sites throughout the Susquehanna River Basin to achieve reduction of future flood damages.

These findings and recommendations placed a low priority on flood control, relying mainly on local protection works and thus, differed somewhat from the recommendations presented in the several earlier flood control studies in the Susquehanna River Basin.

It is also important to note that the Baltimore District Office of the Corps is well advanced in a reanalysis of measures to provide more effective control of flooding in the Susquehanna River drainage basin. The study incorporates a basinwide systems analysis of flood control measures to accomplish flood stage and damage reduction. No details of this study have been made available; however, the study should be completed in the next fiscal year.

Currently, the West Branch subbasin contains four flood control dams above Lock Haven, and two communities along or directly influenced by the West Branch - Williamsport, and Sunbury - have local flood protection projects. There remain 14 cities and boroughs (See Figure No. 1) along the West Branch (1970 population of greater than 1,000) including Lock Haven, plus numerous townships, which are vulnerable to flooding and did experience flood damages from Hurricane Agnes in 1972. In addition, the cities of Williamsport and Sunbury barely escaped inundation during the flood of 1972 by narrow margins estimated at 0.3 feet at

Williamsport and 0.5 feet at Sunbury.

The Agnes flood clearly demonstrated the existing widespread vulnerability to flood damage of communities throughout the West Branch Susquehanna River drainage area. The extent of the flood hazard and the number of communities involved indicates the need for continuing consideration of a regional solution rather than a progressively dependent piecemeal approach to reduce future flood damages.

2. Considerations of Alternatives

The Corps of Engineers Lock Haven Flood Protection Survey Report includes general consideration of alternatives to the proposed project. This analysis provides discussion of the broad topic of flood plain management and includes a report regarding flood proofing which will be discussed later in this section. The topic of dredging is very briefly addressed as is the subject of upstream retention. The report states that all of those measures were either economically unfeasible, not practical, would not appreciably reduce flooding, or did not offer a total solution to the flood problem of the City.

The consideration of these alternative solutions for reduction of future flood damage, other than variations of the wall/levee plan were treated lightly, with an insufficient or total lack of meaningful data for review. As an example, it appears multipurpose water storage, in conjunction with or in lieu of other measures was addressed only in terms of a hurried updating of project costs and benefits related to the Keating site. This project was found feasible for flood control by the Corps in an earlier report cited in House Document 308, 69th Congress, 1st Session dated May 6, 1938. Many factors relevant to a valid re-analysis of this alternative have no doubt undergone change over the years, such as consideration of recreation benefits, the inclusion of pumped storage, improvement of water quality and cost-sharing of certain structural features at a multipurpose project. Also it should be recognized that upstream storage sites other than Keating have been identified in other Corps studies. Flow augmentation and water quality benefits from such storage would seemingly merit a detailed evaluation since the effects are realized over a substantial reach of river extending downstream for the project site. Combinations of upstream storage and wall/levee measures were apparently not considered.

The Survey Report does include an informative Appendix, noted earlier, that is devoted to the analysis, design and cost of "typical" flood proofing of residential, commercial, industrial and public buildings and facilities. However, this aspect of flood plain management is not carried forward as part of a plan to fully or even partially explore this alternative. The discussion of the flood plain management alternative essentially provides only very general information on this broad topic.

3. Project Impact

The proposed local flood protection project at Lock Haven is designed to provide protection against a 200-year frequency flood or a river discharge of 238,000 cfs. This high degree of protection should afford the City freedom from the repeated occurence of flood damages it has suffered since its founding in 1834. The benefits of this protection should be recognizable in an improved economic climate in the City and in the security provided against the high frequency of flooding.

To achieve this high level of local protection certain trade-offs must be accepted - some by City residents and others by residents living upstream or downstream of the proposed project.

The considerable concern for protection of aesthetic amenities stressed in the Draft Survey Report, wherein a moveable wall scheme was incorporated, has been dropped. The view of the West Branch Susquehanna River will be effectively blocked off except at the openings left for bridges, railroads, and those specifically providing for access to the river. The wall will range from 12 to 18 feet in height as it bounds the City along the West Branch with visibility of the river virtually eliminated. The problems of access to the river will be increased due to the height of the wall and the limited number of openings planned.

The security from flooding by the wall/levee system can be expected to encourage more intensive development within the protected area. These kinds of areas suffered the most extensive damage during the Agnes event.

There will be considerable local land rights, relocation and financing costs which City residents will have to bear. The State normally assumes up to one-half of these local costs; however, the routine maintenance and operation costs of the completed project will be the responsibility of the City. This will include storage and upkeep of closure structures and the training of crews to properly install the closures in time of emergency. Maintenance of the wall should be

minimal; however, proper upkeep of the levees and the several pumping stations is a matter requiring regular attention.

Upstream-Downstream Concerns - - The proposed project can be expected to cause an increase in the flood stage for immediately adjacent and downstream communities. This increase reportedly will be minimal based on the Corps findings. However, any action that increases flood stages and water velocity can be expected to further complicate the flood problems of others outside the wall/levee system.

Implementation of the local protection project for Lock Haven will considerably reduce and may fully preclude any future opportunity to economically justify regionally significant, upstream flood water detention measures. Similarly the proposed project could effectively eliminate further consideration of upstream structural measures for the resolution of other water resource related problems such as water supply, power production, low flow augmentation, water pollution control, and recreation.

By reducing the potential to justify upstream storage the remaining downstream flood prone areas of communities along the West Branch might be committed to wall/levee solutions, evacuation or no protection.

Piecemeal community-by-community flood protection solutions may well exceed the time and cost of a carefully considered regional solution or combination of structural and nonstructural measures.

4. Economic

A general review of the economic considerations relative to the proposed project also was carried out.

The Corps utilized a four-zone approach to investigate and identify damage areas within the limits of the proposed local flood protection project. These damage zones are identified in Figure No. 2. Damages from the flood of 1972, estimated to be 50 million dollars were distributed among these four zones as follows:

Zone	Approximate Dollar Damage in* Millions of Dollars
1	$ 47.3
2	2.3
3	0.4
4	0.0
	$ 50.0

Ninety-five percent of the June 1972 flood damages to the Lock Haven area occurred in Zone 1. Within this zone, Piper Aircraft represented a loss of 23 million dollars (49 percent of the zone's damages). In addi-

* - Source - - Erdman-Anthony Assoc., Consultant to the Corps of Engineers

tion residential losses in this zone were estimated to be over 10 million and commercial losses contributed an additional 6 million. The other damages in this area can be attributed to public and semi-public facilities and losses in wages and salaries.

Zone 2 basically represents the majority of the remaining damages within the Lock Haven area. Within this zone Hammermill and the American Analine Company accounted for nearly 100 percent of the total flood losses. Hammermill's losses were approximately 2.0 million dollars.

The Corps report examined the potential of flood proofing the Piper, Hammermill and American Analine Companies from future floods. It states that "flood proofing these industries would eliminate all of their damages from a flood equal to the June 1972 flood." The costs of providing protection measures discussed in the report were $124,000 for Piper, $140,000 for Hammermill and $16,500 for American Analine. Further it was noted that perimeter levee protection of Hammermill could be provided at costs of $195,000 or $440,000 depending upon the level of protection desired. The implementation of these measures by the affected companies reportedly would have reduced the June 1972 flood damages in Lock Haven by $28 million or 56 percent.

It can be expected that Piper and American Analine

and possibly Hammermill have or will act to implement flood protection and flood proofing measures. This possibility is noted in the Corps report. It indicates Piper has moved to (1) establish new communications system to facilitate more advanced warning of flooding, (2) prepare plans for placement of fill along one boundary to a level above that of the Agnes flood and (3) designate a section of land above record flood levels for storage of finished aircraft.

The report also indicates that a levee exists around American Analine Company and describes the actions necessary to rehabilitate the structure and provide closures to make it functional in flood situations.

Currently a Federal Urban Renewal Project for the City of Lock Haven is moving toward implementation. The project area encompasses 193.0 acres, mainly residential, within the city and will include acquisition of properties, demolition of substandard structures, rehabilitation of structures not acquired and facilities of new residential, commercial and industrial development. The project is not dependent on protection of the City from flooding; however, it is required that the City adopt and enforce flood plain land use and control ordinances which meet the criteria set forth in Federal

Insurance Administration Regulations. The regulations essentially require that all residential structures must have first floor at least one foot above the 100-year flood line and all nonresidential structures must be flood proofed to that level. In addition, all recipients of Federal funds (rehabilitation and redevelopment) must be adequately insured against flood damage in accordance with the Flood Disaster Protection Act of 1973.

The City's proposed urban renewal project and the ongoing flood proofing and protection programs initiated by industry may significantly reduce the flood protection benefits from the proposed project.

5. Public Response

Protection of the City of Lock Haven from flooding by the West Branch and Bald Eagle Creek, by construction of a wall/levee system has been advocated by the Corps of Engineers dating to 1936. In the course of the several previously noted Corps studies of flood problems in the West Branch drainage area, local protection for Lock Haven repeatedly has been discussed or recommended. Local support for a local protection project was not evidenced at the conclusion of the several earlier studies.

The current study and the resulting recommendation for a wall/levee system to provide flood protection for the City of Lock Haven was initially rejected by the City. City Council favored the concept of "flood control" as opposed to individual community "flood protection" and supported a detailed and extensive analysis of watershed impoundments similar in scope to that done for the wall/levee system proposal. The Corps responded to the Council's position by letter which noted that (1) in view of the City Council's opposition to the wall/levee system the Corps would recommend Congress take no further action towards providing a local flood protection project at Lock Haven and (2) that funds for other studies, presumably meaning reconsideration of major and minor upstream storage measures, had not been made available by Congress.

The City Council apparently concluded from the Corps' letter that upstream retention would not become a reality which left the City with the alternatives of either supporting the local flood protection project, continued flooding, or a large scale flood plain management program which would be tantamount to evacuation of a major part of the City. After about one year of deliberation the City Council reversed its position and voted to support the project. Justifying their reversal they stated that "we have come to the realiza-

tion that Lock Haven cannot champion regional solutions if it means our citizens continue to suffer".

Prior to initiating formal review of the proposal the Commission requested that a joint SRBC-Corps public meeting be held to obtain further public comment on the proposal. This meeting was held on August 20, 1974 at Lock Haven.

The seriousness of the Lock Haven flood hazard, the obvious need for an increased regional level of flood control and the widespread opposition to a purely local solution to flood protection at Lock Haven were the major topics addressed in the statements presented at the August 20, 1974 meeting. During the meeting there was considerable "give and take" discussions of these topics among Commission members, Corps staff, those presenting statements and the audience.

A review of the testimony presented at the meeting and that submitted in writing for the record indicates that City Council, City oriented agencies, commercial and industrial interests, and a goodly number of City residents favored the project.

Favor of upstream retention or other measures was expressed by the Clinton County Commissioners, the Clinton County Planning Commission, several adjoining communities and townships, representatives of local, regional and national associations,by citizens from the City and other areas.

The following Table No. 1 identifies the municipal governmental agencies favoring a regional solution and those favoring the proposed Lock Haven Local Flood Protection Project.

TABLE NO. 1

MUNICIPAL GOVERNMENTAL AGENCIES FAVORING A REGIONAL SOLUTION
AND
THOSE FAVORING THE PROPOSED LOCK HAVEN LOCAL FLOOD PROTECTION PROJECT

FAVORING A REGIONAL SOLUTION				FAVORING THE LOCK HAVEN LOCAL FLOOD PROTECTION PROJECT	
COUNTY	COUNTY COMM.	CO. PLANNING COMMISSIONS	CITIES, BOROUGHS, TOWNSHIPS	COUNTY	CITIES, BOROUGHS, TOWNSHIPS
Clinton	Clinton	Clinton	Avis Boro.	Clinton	Lock Haven City
			Beech Creek Boro.		Castanea Twp.
			Flemington Boro.		
			Mill Hall Boro.		
			Renovo Boro.		
			Allison Twp.		
			Colebrook Twp.		
			Dunnstable Twp.		
			Logan Twp.		
			Pine Creek Twp.		
			Woodward Twp.		
Lycoming	--	--	Williamsport City		
			Duboistown Boro.		
			Jersey Shore Boro.		
			Montoursville Boro.		
			Muncy Boro.		
			S.Williamsport Boro.		
			Nippenose Twp.		
			Porter Twp.		
Northumberland	--	--	Sunbury City		
			Watsontown Boro.		
Union	Union	--	Lewisburg Boro.		

SUMMARY AND RECOMMENDATIONS

The vulnerability to flooding of communities along the West Branch Susquehanna River is well established. Lock Haven, a major damage center during the 1972 flood is an outstanding example of high level of susceptibility of West Branch communities to flooding. Over a period of 38 years the Corps of Engineers has engaged in studies to consider solutions to the flooding problems along the West Branch. To date, four major flood water retention structures have been constructed in the West Branch Susquehanna subbasin. The flood of June 1972 emphasized that a broad regional flood problem remains unresolved in this subbasin.

There is an obvious need to protect the City of Lock Haven from future flood damages. The City's flood history coupled with the heavy development within the flood plain merit the Corps' past and current efforts to provide a reasonable level of flood protection. Approximately 955 acres, or over 55%, of the City and the immediately adjacent area were inundated by the 1972 flood. The proposed project will protect the City from a recurrence of a 200-year flood.

The review revealed five major areas of concern. They are:

(1) the regional nature of flooding along the West Branch

(2) the limited extent to which alternatives to the proposed project were evaluated

(3) the approach by the Corps to an historically regional problem which resulted in a recommendation to design a purely local flood protection scheme for a single flood damage center

(4) the broad regional implications of the proposed wall/levee project for Lock Haven

(5) the nature of the public response to the proposal

It is recommended that:

(1) The proposed Phase I design memorandum stage of advance engineering and design for the Lock Haven Flood Protection Project be included in the Comprehensive Plan, Appendix D, for immediate study.

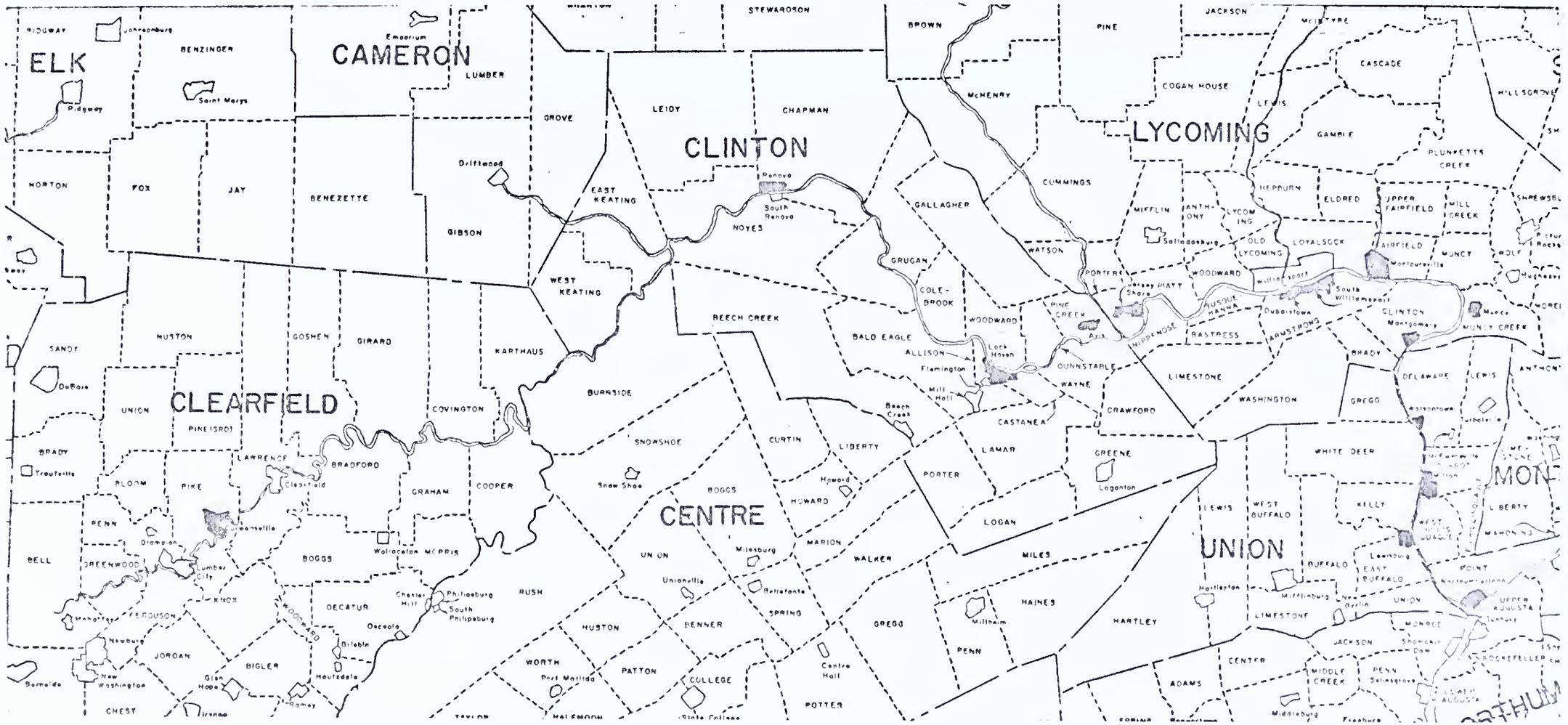
(2) The Commission support a Corps request for authorization to proceed with the Phase I design memorandum stage of advance engineering and design for the Lock Haven Flood Protection Project; PROVIDED, the authorization direct the Corps to:

a) Identify and evaluate alternative structural and/or nonstructural measures and/or mixes thereof taking into consideration the attendant benefits to other water resources needs.

b) Identify and evaluate potential increases in flood stages and the resulting economic impact from the project on upstream and downstream areas.

c) Re-evaluate the project's potential flood protection benefits to Lock Haven taking into consideration the self-help protection programs initiated by industry and the City's proposed urban redevelopment project.

(3) The Commission withhold any action on the Phase II design memorandum stage until the Corps' ongoing basinwide systems analysis for flood stage reduction is completed and a plan for reduction of future flood damages has been developed for the remaining vulnerable communities along the West Branch Susquehanna River.



CITIES AND BOROUGHS (POP. 1,000 OR MORE)

ON THE WEST BRANCH SUSQUEHANNA RIVER

THAT ARE VULNERABLE TO FLOODING

FIGURE NO. 1

DAMAGE ZONES WITHIN THE LIMITS OF THE PROPOSED

LOCK HAVEN LOCAL FLOOD PROTECTION PROJECT

FIGURE NO. 2

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